pare unsaturated vapor by merely diluting the saturated vapor with air. The percentage of benzol was checked by combustion analysis. It was found that all of the benzol could be separated at —78° C.

The above tests show that as far as the Pittsburgh gas is concerned the method is satisfactory.

In extracting benzol from coke-oven gases (large-scale operations for this purpose are in progress), the gas is washed with a petroleum distillate, in which the benzol is dissolved, also toluol and other products. As a check on the efficiency of the scrubbing apparatus there is needed a rapid test for the benzol, etc. In this case, toluol or other easily condensible hydrocarbons would interfere with the test, as the vapor pressure of toluol is only 0.0058 mm. at —78° C.[1] The best one could do would be to estimate them together, along with any other vapors that might also be retained, so that the test would give the efficiency of absorption of all the easily condensible vapors in the scrubbing oil. The authors have made no experiments with coke-oven gas.

Acknowledgment is made to Dr. G. A. Hulett, consulting chemist to the Bureau of Mines, for suggesting this scheme of analysis.

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THE POTASH SITUATION[2]

By Edward Hart

The files of the Patent Office show that the question of supplying our own potash has greatly exercised the brains of inventors. Among the sources of supply so far proposed two have seemed to me of special interest. With the termination of the present highly artificial situation, German competition of the old-fashioned Standard Oil brand must again be encountered. It seems highly improbable that most of the processes which must depend for revenue upon the price of potash alone can be successful because the nature of the German source of supply is such as to give them an immense initial advantage.

A considerable amount of potash must in the near future come from cement fume. This appears to exist chiefly as sulfate. A sample, which I obtained from this source, contained 94 per cent sulfate and 5 per cent carbonate. The sulfur probably comes from the coal. The total amount obtainable from this source is problematical, of course, and it is questionable whether all the potash can be extracted, but if we place the amount recoverable as 0.4 per cent sulfate, the total amount obtainable would be in the neighborhood of 60,000 tons annually.

This cement dust has caused much annoyance and even serious loss in Northampton Co., Pa., and the adjacent districts and cement manufacturers recognize that condensation of this fume is one of the problems that must soon be solved. They also seem to be of the opinion that so far no practical solution has been offered. That this fume must be condensed is quite independent of any revenue to be derived from the material recovered. The dust recovered, only partly converted into cement, is worth, as cement material, but 75 cents per ton.

Another source that has attracted much attention is the potash of feldspar.

Arthur S. Watts has enumerated the feldspar supplies of the Eastern United States.[1] He has, however, omitted to mention the fact that a considerable amount of very fine potash feldspar is imported from Canada where it occurs in a great lens deposit, unlike any other deposit I have seen, about thirty miles north of Kingston. This deposit is not a pegmatite in the ordinary sense of that term. The spar occurs as a mass of uniform composition in a deposit which has been mined as an open cut, 40 feet in width, together with lump quartz of apparently good quality in a deposit of less width alongside of and partly surrounded by the spar. This deposit contains no mica. The mining cost of this material is very low, as very little cobbing is needed, but the cost of transportation to our markets is very high.

A study of the analyses quoted by Watts shows that very few orthoclase deposits run above 12 per cent K_2O, and as a matter of fact, I think 11 per cent is a much safer basis for such calculations. This corresponds to 220 pounds K_2O, 350 pounds KCl or 422 pounds K_2SO_4 per short ton of spar. Lump spar of this quality cannot be obtained at the mine at less than $3.00 to $3.50 per ton, f. o. b. car.

Many of the processes proposed contemplate the extraction as chloride by some modification of the J. Lawrence Smith method, using calcium chloride as the material for supplying chlorine. If we allow two cents per pound as the value of potassium chloride, a figure above the truth for normal conditions, and $2^{1}/_{4}$ cents for potassium sulfate (which may be produced in my own process) this would yield:

350 lbs. KCl at 2 cents	$7.00
422 lbs. K_2SO_4 at $2^{1}/_{4}$ cents	9.49

It is at once evident that the probability of profit from any process which contemplates only the extraction of potash from this material is very small.

In mining feldspar in most localities, only a small proportion of the material taken out can be classed as No. 1 spar, and very large refuse heaps accumulate which may contain as much as 9 per cent potash and 15 per cent alumina. In addition to this, not a few of the openings yield quantities of material so mixed with mica and still high in potash, as to be available for potash extraction, while quite useless as feldspar. It is from these materials, quite low in first cost, that our potash must be derived. Such material exists in quantity in the district near Erwin, Tenn., on the Carolina, Clinchfield and Ohio Railroad, where a plant is to be erected by the Clinchfield Products Company in the near future. This location has the advantage of proximity to supplies of cheap coal and barytes, both of which are needed in the exploitation of the process to be used.

Briefly, the process consists in heating a mixture of feldspar refuse and barytes in proper proportion in a reducing atmosphere where a barium aluminum potassium silicate results containing about 36 per cent silica. This is run into water while molten and the granulated material ground and floated. The settled material is then treated as a paste with the proper quantity of sulfuric acid which decomposes it perfectly, giving a solution of alum and aluminum sulfate and a solid residue consisting of nearly equal parts of very finely divided barium sulfate and silica. It might be supposed that the silica would be so gelatinous as to be unwashable, but this has not been found true. On the contrary, where properly manipulated, the precipitate is somewhat granular, but entirely free from grit, and forms an excellent material, after ignition, for use as a pigment in printing ink, rubber incorporation and as a coating for paper. In value we believe this material will be found to be superior to very pure china clay. As you will see[1] from the sample submitted, it has a beautiful white color.

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[1] Landolt and Börnstein Tables, **1912**, p. 394; according to Barker.

[2] Presented at the 50th Meeting of the American Chemical Society, New Orleans, March 31 to April 3, 1915.

[1] *Trans. Am. Ceramic Soc.*, **16** (1914), 80.

The solution, when evaporated, yields the potash as potash alum, and if the little iron present be kept in the ferrous condition, this alum, after washing with a little water and whizzing, is entirely free from iron and well suited for the preparation of pure potassium sulfate and iron-free alumina or aluminum sulfate, as desired. We expect to sell our alum as such so far as the market will take it and decompose only so much of it as may be necessary. This process may, therefore, furnish no potash at all. But inasmuch as potash for alum production now comes from over seas, this method is an indirect contribution to the supply.

The solution never contains enough potash to precipitate all the aluminum as alum. An excess of aluminum sulfate remains in the mother liquor together with the sodium and a little iron. This is allowed to cool and is broken up, furnishing a material equal in value to that now made from bauxite.

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AVAILABILITY OF ORGANIC NITROGEN[2]

By J. E. BRECKENRIDGE

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In the last few years this subject has been coming to the front very rapidly. In some of the northern states more unscrupulous manufacturers secured all their nitrogen in their 1 per cent nitrogen brands from garbage tankage and peat. The state control officials soon became aware of the practice and argued that the farmer was paying for first-quality readily active nitrogen and received an inert and less expensive nitrogen; in other words, the farmer was not receiving full value for his money. This fact led to a thorough investigation as to the methods by which the control people could identify the activity of organic nitrogen. Much criticism was made as to the rendering available of inert organic nitrogen such as horns, hoofs, hair, leather, feathers, fur waste, etc., by digesting in sulfuric acid. While it was believed possible, it was considered that manufacturers were not doing it.

This led to the appointing of a committee to arrange, if possible, for a visit to some factory to watch the process. Such arrangements were made. Samples of all materials which went into the mixing were drawn as they entered the mixer. One hundred and fifty tons were mixed, the den sealed by officials and allowed to stand 48 hours. Then the seal was broken, and in the presence of the state committee, the den was discharged and samples drawn. This sample was used to further investigate the methods for active organic nitrogen.

From this investigation came the publication of a pamphlet dated March 4, 1911, entitled "A Method for Examining the Activity of Organic Forms of Nitrogen," signed by the directors of the New York, New Jersey, and New England States Experiment Stations.

This pamphlet included instructions for carrying out the Alkaline Permanganate Method and results obtained by seven Experiment Stations' Laboratories on the three samples.

SAMPLE NO. 1 was base goods made from hair waste, treated sole leather, garbage tankage and sulfuric acid. The average test on this was:

	Per cent		Per cent
Total nitrogen	1.75	Water-soluble organic	1.01
Nitrogen as ammonium salts	0.25	Water-insoluble organic	0.49
Total organic	1.50	Active insoluble	0.21
		Inactive insoluble	0.28

The percentage availability of the insoluble by this method on this sample varied from 39.21 to 47.36 per cent, a difference of 8.15 per cent.

SAMPLE NO. 2 was made from blood (100 parts), cottonseed-meal (50 parts), acid phosphate (500 parts) and muriate of potash (75 parts). Average total nitrogen, 2.50 per cent. The percentage of available insoluble nitrogen varied from 61.11 to 77.97 per cent.

SAMPLE NO. 3 was made from treated sole leather (200 parts), garbage tankage (150 parts), peat (100 parts), acid phosphate (500 parts), and muriate of potash (50 parts). The average total nitrogen was 2.09 per cent. The percentage availability of insoluble nitrogen varied from 37.06 to 53.03 per cent.

The following forms for expressing results were suggested:

LONG FORM, to be used where nitrates and ammonia are present and determined:

Nitrogen as nitrates
Nitrogen as ammonium salts
Water-soluble organic nitrogen
Active insoluble organic
Inactive insoluble organic
Total nitrogen

SHORT FORM (where it is desired to shorten the above procedure):

Water-soluble nitrogen
Active insoluble organic
Inactive insoluble organic
Total nitrogen

We also have in this pamphlet a chart showing the comparison as to availability of insoluble nitrogen, of the results by the Alkaline Method and pot experiments.

This was the first instance of grading of quality of organic nitrogen by chemical methods. Jones of the Vermont Station had done much work on this and was the first to report this kind of work; he reported according to the long form, giving the water-soluble organic nitrogen, as well as the nitrates, ammoniacal,

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[1] Samples of all materials were furnished for inspection.

[2] Chairman's Address, Fertilizer Division, 51st Meeting of the American Chemical Society, New Orleans, March 31 to April 3, 1915.